Enthalpy changes

1) (i) Write an equation for the reaction that represents the heat of combustion of sulfur $\Delta_c H$ (S, *s*).

(ii) Explain why $\Delta_c H$ (S, *s*) and $\Delta_f H$ (SO_2, *g*) have the same value.

2) (i) Explain what is meant by the symbol Δc*H* °

(ii) Write the equations which represent the enthalpy of fusion, Δfus*H* °, and vaporisation, Δvap*H* °, for water.

(iii) Explain why Δvap*H* °(H_2O) = 40.7 kJ mol–1 is greater than Δfus*H* °(H_2O) = 6.01 kJ mol–1.
In your answer you should include:
• a description of the attractive forces between the molecules in the different phases (states) of water
• a discussion of how these forces relate to the given enthalpy values.

3) i) Explain what is meant by the term Δvap*H* °.

ii) Explain why Δf *H* ° (CO_2(*g*)) and Δc *H* (C(*s*)) have the same value of −394 kJ mol−1.

4) i) Write the equation for which the enthalpy change is the enthalpy of formation, $\Delta f\ H°$, for zinc oxide.

(ii) Write the equation for which the enthalpy change is the enthalpy of fusion, $\Delta fus H°$, for zinc sulfide.

(iii) Give a reason why $\Delta fus H°$ is always greater than zero.

5) Define the term $\Delta vap H°$.

6) Urea, $(NH_2)_2CO$, which is a white crystalline solid, is widely used as a fertiliser. Write the equation for which the enthalpy change is:

(i) the enthalpy of formation, $\Delta f H°$, for urea

(ii) the enthalpy of fusion, $\Delta fus H°$, for urea

7) Write the equation for the reaction that has an enthalpy change given by $\Delta_f H(HCl, g)$.

8) i) Write the equation for the reaction that has an enthalpy change equal to $\Delta_c H\ (H_2, g)$

ii) Explain why $\Delta_f H(H_2O, \ell)$ is equal to $\Delta_c H(H_2, g)$.